

SOP-06.32, R2, Revision Log

Revision No.	Effective Date	Prepared By	Description of Changes	Affected Pages
0	4/27/2001	Jennifer Kofoed	New procedure	0
1	07/12/02	Alethea Banar	Revised to address process changes and meet current procedure format requirements	All
2	10/18/2004	Donald D. Hickmott	Revised to update format; reflect current RRES-RS/ECR organizational structure.	All

SOP-06.32, R0, Multi-Level Groundwater Sampling of Monitoring Wells Westbay MP System

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List of Acronyms and Abbreviations

EC	electrical conductance	R	resistance
ECR	Environmental Characterization and Remediation	RPF	Records Processing Facility
		RRES	Risk Reduction and Environmental Stewardship
LANL	Los Alamos National Laboratory	RS	Remediation Services
NTU	nephelometric turbidity unit	S	Siemen
pH	hydrogen-ion activity	SOP	standard operating procedure
PPE	personal protective equipment	SSHASP	site-specific health and safety plan
QP	quality procedure	VOC	volatile organic compound
QPPL	quality program project leader	WQH	Water Quality and Hydrology

SOP-06.32, R0, Multi-Level Groundwater Sampling of Monitoring Wells, Westbay MP System

1.0 PURPOSE

This standard operating procedure states the responsibilities and describes the process for using the Westbay MP System to sample multi-completion monitoring wells within the Los Alamos National Laboratory (LANL or the Laboratory) Risk Reduction and Environmental Stewardship Division (RRES) Remediation Services (RS) Environmental Characterization and Remediation (ECR) Group.

2.0 SCOPE

All **RRES-RS/ECR participants** shall implement this procedure when using the Westbay MP System to sample multi-completion monitoring wells for RRES-RS/ECR.

3.0 TRAINING

- 3.1 **RRES-RS/ECR participants** shall train to (e.g., by reading and/or completing on-the-job or classroom training) and use the current version of this procedure.
- 3.2 **RRES-RS/ECR participants** shall document training to this procedure in accordance with QP-2.2, Personnel Training Management.
- 3.3 The responsible **project leader** shall monitor the proper implementation of this procedure.
- 3.4 The responsible **team leader** shall ensure that RRES-RS/ECR participants complete all training assignments applicable to this procedure.
- 3.5 **RRES-RS/ECR participants** may request assistance with implementation of this procedure from the ECR Quality Integration and Improvement workgroup.

4.0 DEFINITIONS

- 4.1 *Electrical conductance or conductivity (EC)* – A measure of the ease with which an electrical current flows through a substance under the influence of an applied electrical field. When measured in water, it is dependent upon the presence of dissolved ions (total and relative concentrations, valence and mobility) and temperature. It is the reciprocal (inverse) of the resistance (R) in ohms between the opposite faces of a 1-cm cube of water at a specified temperature. Because R has units of ohm-meters ($\Omega \text{ cm}$), EC has units of $(\Omega \text{ cm})^{-1}$, called Siemens (S). Most natural waters

have rather low conductivities, so EC is generally measured in microSiemens per centimeter ($\mu\text{S}/\text{cm}$). An EC value of $1\ \mu\text{S}/\text{cm}$ is equivalent to a resistance of $10^6\ \Omega\cdot\text{cm}$.

- 4.2 *Hydrogen-ion activity (pH)* – The effective negative log base 10 of hydrogen ion $[\text{H}^+]$ activity. A measure of how acidic or basic a solution is (numerically equal to seven for neutral solutions, increasingly basic above, and acidic below that value).
- 4.3 *Multiple-completion well* – A well constructed with two or more well screens across an equal number of zones of groundwater saturation.
- 4.4 *Personal protective equipment (PPE)* – Clothing worn by workers to minimize the potential for contamination to skin or personal clothing. Also referred to as anti-contamination clothing or anti-C's. The degree of protective clothing required depends on the work area and nature of the job.
- 4.5 *RRES-RS/ECR participant* – An inclusive term for any University of California/staff augmentation employee, deployed worker, or subcontractor, inclusive of project leaders, team leaders, and project personnel, who participates in activities conducted as part of or on behalf of RRES-RS/ECR.
- 4.6 *Site-specific health and safety plan (SSHASP)* – Health and safety plan that is specific to a site or RRES-RS/ECR-related field activity that has been approved by an RRES-RS/ECR health and safety representative. This document contains information specific to the project including scope of work, relevant history, descriptions of hazards by activity associated with the project site(s), and techniques for exposure mitigation (e.g., PPE) and hazard mitigation.
- 4.7 *Specific conductance* – The EC that would occur between the faces of a 1-cm cube of water at 25°C . Since EC is temperature sensitive, it is commonly corrected to its equivalent value at 25°C for data comparison. Some equipment makes this conversion automatically, in which case these readings should be noted as "at 25°C ." Otherwise, the water temperature at the time of the conductance reading should always be recorded along with the conductance measurement so that the reading can later be corrected to 25°C .
- 4.8 *Turbidity* – Refers to inorganic solids and organic matter suspended in water. Turbidity, in nephelometric turbidity units (NTU), is measured as the intensity of light scattered by the suspended particulates in a water sample relative to a standard reference suspension. The goal of well purging for water sampling is to reduce turbidity to 5 NTU or less.

- 4.9** *Volatile organic compounds (VOCs)* – A class of chemical compounds, predominantly hydrocarbons and halogenated hydrocarbons, with low molecular weights and low boiling points that are insoluble or slightly soluble in water.

5.0 BACKGROUND AND PRECAUTIONS

- 5.1 Users shall use this SOP in conjunction with an approved SSHASP. Also, consult the SSHASP for information about and use of applicable PPE.
- 5.2 The Westbay MP System is a modular multi-level groundwater-monitoring device that uses a single closed access tube with valved ports. The valved ports provide access through a single well casing to several different levels of a borehole. The modular design permits the establishment during well completion of as many monitoring zones as desired. Under normal aquifer conditions, this system also allows for sampling at an in-situ pressure without purging the zone before a sample is collected.
- 5.3 The Westbay MP System consists of casing components permanently installed in the borehole, portable pressure measurement and sampling probes, and specialized tools.
- 5.4 Groundwater samples collected by using the Westbay MP System are representative of the saturated zone within a given interval of the hydrogeologic system and, discounting drilling artifacts, potentially representative of the aquifer in which the well is installed. Consult the well completion report for specific locations/depths of the valved sampling ports for each well.
- 5.5 RRES-RS/ECR participants should handle all waste generated from monitoring well sampling in accordance with SOP-01.06, Management of ER Project Wastes.
- 5.6 Report any deviation from this procedure in accordance with QP-5.7, Notebook Documentation for Environmental Restoration Technical Activities, and/or SOP-01.01, General Instructions for Field Investigations.

6.0 RESPONSIBLE PERSONNEL

The following personnel are responsible for activities identified in this procedure:

- Field team leader
- Field team members
- RRES-RS/ECR participants
- Sample Management Office (SMO) personnel

7.0 EQUIPMENT AND SUPPLIES

A checklist of suggested equipment and supplies needed to implement this procedure is provided in Attachment A.

8.0 PROCEDURE

8.1 Coordinate with Sample Management Office

8.1.1 **RRES-RS/ECR participants** shall coordinate the sampling effort with the SMO.

8.1.2 **SMO personnel** shall give guidance regarding sample containers, preservation, and shipment to the SMO.

8.2 Plan Document

RRES-RS/ECR participants shall refer to the site work plan, sampling plan, or other appropriate plan to locate sampling site(s) and anticipated scope of work.

8.3 Coordinate Notifications

8.3.1 **RRES-RS/ECR participants** shall coordinate with the appropriate Laboratory contact to give written notification to the New Mexico Environmental Department ten (10) days prior to the scheduled sample collection date.

8.3.2 If transducers require removal before sampling begins, **RRES-RS/ECR participants** shall notify the RRES Water Quality and Hydrology (WQH) Group a minimum of three (3) days prior to sampling.

8.3.3 **RRES-RS/ECR participants** shall notify the Laboratory facility manager of the sampled area.

8.4 Ensure Instrument Calibration

8.4.1 The **field team leader** shall ensure that measuring and test equipment (M&TE) is controlled in accordance with QP-5.2, Control of Measuring and Test Equipment.

8.4.2 **Field team members** shall calibrate instruments to be used for water quality readings.

Note: Refer to SOP-06.02, Field Analytical Measurements of Groundwater, or the instrument's operator manual as applicable for calibration requirements and instructions.

8.4.3 **Field team members** shall record calibration and instrument model information in Field Notebook or Daily Activity Log and Water Quality Sample Records.

8.5 Perform Sampling Using the Westbay MP System

Field team members shall implement the following:

- 8.5.1 Assemble the appropriate equipment and supplies.
- 8.5.2 Set up the down-hole winch over the monitoring well.
- 8.5.3 Attach the MOSDAX handheld controller to the winch control panel. (Refer to the Westbay Operations Manual.)
- 8.5.4 Attach the MOSDAX sampler/monitoring probe to the end of cable winch line. (Refer to the Westbay Operations Manual.)
- 8.5.5 Attach (up to four) one-liter stainless steel sampling bottles to the sampler probe.
- 8.5.6 Complete surface function checks, noting that the arm should take 15 rotations to extend and the shoe should take under 23 rotations. If there are discrepancies in these numbers, the instrument will not properly seat. Fill out the Groundwater Sampling Field Data Sheet and follow the steps for retrieval of samples (Attachment B).
- 8.5.7 Fill out the Water Quality Sampling Record and record pertinent field measurements, chemistry determinations, and other information as needed (Attachment C).
- 8.5.8 Perform field chemistry measurements on each sample run. Discard water used for field measurements upon completion, do not use for analytical sample. Special precautions should be taken if the turbidity is > 5 NTU. Consult the project leader to identify if only filtered samples are required.
- 8.5.9 Collect groundwater samples according to SOP-01.02, Sample Container and Preservation, and SOP-06.03, Sampling for Volatile Organic Compounds in Groundwater (if applicable). Collect non-filtered samples by filling the bottles in the order of most volatile to least volatile. If a priority list is established, collect the samples in that order.
- 8.5.10 Collect a VOC sample by opening the valve on the bottom of the Westbay sample bottle and adjusting the flow to slowly fill the vial until a reverse meniscus forms above the top of the vial. Screw on the cap, invert, and tap the bottle to check for the presence of air bubbles. If air bubbles are present, collect the sample again.
- 8.5.11 Collect filtered samples using a 0.45- μ m pore filter. The filter may be a flat membrane supported by a filter-holder assembly or may be an in-line cartridge filter. If the filter-holder assembly is used,

field personnel must ensure that it was thoroughly cleaned and decontaminated. Filters coarser than 0.45 µm may be used to pre-filter; however, the final filter must be < 0.45 µm. Flow a minimum of 100 ml of the sample through the filter and discard the filtered water before collecting a filtered sample for analysis. Follow SOP-01.02 when choosing the proper container and preservation technique for each analytical suite.

- 8.5.12 Occasionally it may be necessary to collect a sample in the field and filter at another location. Reasons include the following: (1) it may not be practical to use filtration apparatus at a remote site or (2) the water sample is too turbid to filter at the time of collection. If the latter is the case, allow the suspension in the water sample to settle before filtering and preserving. Use an appropriate container when collecting water for filtering off-site. For example, collect water destined for metals and anions analysis in a polyethylene bottle or carboy; transport organics in a glass container. Do not use the same container that is used to transport the unfiltered water from the field as the final container that is shipped to the analytical laboratory. All containers must meet the minimum cleanliness specifications described in SOP-01.02.
- 8.5.13 Label sample containers. Preserve and store in accordance with SOP-01.02 and fill out the sample collection log and chain of custody.
- 8.5.14 Upon completion of sampling activities at each port, decontaminate all sampling equipment in accordance with SOP-01.08. Rinse the sampler around the face seal and the bottom connector. With the sampler valve open, flush the interior or the sampler from the bottom connector. In similar fashion, decontaminate the interconnected hoses.
- 8.5.15 Handle all wastewater generated from decontamination in accordance with SOP-01.06.
- 8.5.16 Secure the well casing and well vault. Restore the site to its pre-sampling condition. Secure the site on departure.

9.0 LESSONS LEARNED

- 9.1 Before performing work described in this SOP, **RRES-RS/ECR participants** should search for applicable lessons learned at the Department of Energy Lessons Learned Information Services Web page (<http://www.tis.eh.doe.gov/II/II.html>) and/or the LANL Lessons Learned Resources Web page (http://www.lanl.gov/projects/lessons_learned/).

- 9.2 **RRES-RS/ECR participants** shall submit any applicable lessons learned during work performance and/or after the completion of work activities described in this SOP to the LANL Lessons Learned System at http://www.lanl.gov/projects/lessons_learned/.

10.0 RECORDS

This procedure generates the following records for submittal to the Records Processing Facility:

- Chain-of-Custody/Request for Analysis Form
- Daily Activity Log or Completed Field Notebook (copies submitted quarterly)
- Sample Collection Log
- Water Quality Sampling Record for Westbay Wells (Attachment C)
- Westbay Groundwater Sampling Field Data Sheet (Attachment B)

11.0 REFERENCES

- 11.1 To properly implement this SOP, **RRES-RS/ECR participants** should become familiar with the contents of the following documents located at http://erinternal.lanl.gov/home_links/Library_proc.shtml:
- SOP-01.02, Sample Container and Preservation
 - SOP-01.03, Handling, Packaging, and Shipping of Samples
 - SOP-01.04, Sample Control and Field Documentation
 - SOP-01.06, Management of Environmental Restoration Project Wastes
 - SOP-01.08, Field Decontamination of Drilling and Sampling Equipment
 - SOP-06.02, Field Analytical Measurements of Groundwater
 - SOP-06.03, Sampling for Volatile or Organic Compounds in Groundwater
 - QP-2.2, Personnel Training Management
 - QP-4.2, Standard Operating Procedure Development
 - QP-4.4, Record Transmittal to the Records Processing Facility
 - QP-5.2, Control of Measuring and Test Equipment
 - QP-5.7, Notebook Documentation for Environmental Restoration Technical Activities
- 11.2 **RRES-RS/ECR participants** should also become familiar with the contents of the following documents available from their project leader:

- http://erinternal.lanl.gov/home_links/Library_proc.shtml: Operations Manual, MOSDAX Sampler Probe – Model 2532
- Operations Manual, MOSDAX Handheld Controller – Model 2525
- Operations Manual, Nonvented Sample Bottle – Model 2420

12.0 ATTACHMENTS

RS/ECR participants may locate all example forms associated with this procedure at <http://erinternal.lanl.gov/Quality/user/forms.asp>.

Attachment A:	Equipment and Supplies Checklist for Sampling the Westbay MP System® (1 page)
Attachment B:	Westbay Groundwater Sampling Field Data Sheet (1 page)
Attachment C	Instructions for Completing Westbay Groundwater Sampling Field Data Sheet (2 pages)
Attachment D	Water Quality Sampling Record for Westbay Wells (3 pages)
Attachment E	Instructions for Completing Water Quality Sampling Record for Westbay Wells (3 pages)

[Using a CRYPTOCARD, click here to record "self-study" training to this procedure.](#)

If you do not possess a CRYPTOCARD or encounter problems, contact the RRES-ECR training specialist.

Attachment A: Equipment and Supplies Checklist for Sampling the Westbay MP System

- ☐ Tubing for vacuum pump
- ☐ Monitoring equipment (turbidity, pH or P [if called for], alkalinity kit, conductivity, dissolved oxygen, and temperature)
- ☐ MOSDAX sampler probe – Model 2532
- ☐ MOSDAX handheld controller – Model 2525
- ☐ Four Non-vented sample bottles – Model 2420
- ☐ Sample containers and preservatives
- ☐ Coolers and Blue Ice (or equivalent)
- ☐ Plastic sheeting
- ☐ Filters (if required)
- ☐ Daily Activity Log forms
- ☐ Chain-of-Custody/Request-for-Analysis forms
- ☐ Sample Collection Log forms
- ☐ Variance Log
- ☐ Custody seals
- ☐ Sample labels
- ☐ Any PPE listed or required in the SSHASP
- ☐ Vacuum pump w/ backup hand pump
- ☐ Cables for hook-up to 12V battery
- ☐ Well-Specific Attachments to SOP
- ☐ Sampling trailer w/ winch and generator
- ☐ Graduated beaker for field parameter collection
- ☐ Field logbook to record all field activities
- ☐ Ice chests and ice for sample storage
- ☐ Alconox and De-ionized water for decontamination

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Attachment B: RRES-RS/ECR, Groundwater Sampling Field Data Sheet

Project: _____

Monitoring Well No: _____

Sampling Zone No(s): _____

Date: _____

Start Time: _____

Technicians: _____

[illegible]

Additional Comments: (pH, Turbidity, S.C, etc.)

Attachment C: Instructions for Completing Westbay Groundwater Sampling Field Data Sheet

Use an indelible dark-ink pen. Make an entry in each blank. For entry blanks for which no data are obtained (except in Comments section), enter “UNK” for unknown, “N/A” for not applicable or “ND” for not done, as appropriate. To change an entry, draw a single line through it, add the correct information above it and date, initializing the change.

Header Information:

1. Project – Record the project title.
2. Monitoring Well No. –Record the number of the well sampled.
3. Sample Zone No. – Record the number and depth of the zone sampled.
4. Date —The date the zone was sampled.
5. Start Time – The start time the zone was sampled, in military format.
6. End Time – The time the sampling completed, in military format.
7. Technicians – Record the initials of the persons performing the sampling.

Surface Function Checks:

1. Zone No. – Record the number of the zone sampled.
2. Run No. – Record the number of the run.
3. Shoe Out – Place a check in this box after activation of the shoe on the sampler in the vacuum coupling.
4. Close Valve – Place a check in this box after closure of the valve on the sampler.
5. Check Vacuum – Record the final pressure after a vacuum maintained.
6. Open Valve – Place a check in this box after the valve opened.
7. Evacuate Container – Record the final pressure after evacuation of the Westbay sample containers.
8. Close Valve – Place a check in this box after the valve closure.

Position Sampler:

1. Locate port, arm out, and land probe – Place a check after each performed function.

Sample Collection Checks:

1. Pressure in MP – Record the pressure reading inside the MP casing after the probe has landed on the coupling.
2. Shoe Out – Place a check in this box after the shoe activation.
3. Zone Pressure – Record the pressure of the formation.

4. Open Valve – Place a check in this box after opening the valve.
5. Zone Pressure – Record the pressure when the pressure in the Westbay sample bottles equals the zone pressure from the first reading of the zone pressure (number 3).
6. Close Valve – Place a check in this box after the valve closure.
7. Shoe In – Place a check in this box after the shoe retraction.
8. Pressure in MP – Record the pressure in the MP casing. A reading the same as in number 1 indicates the sample is ok.
9. Comments – Record any additional information and any problems associated with the run.

Attachment D: Water Quality Sampling Record for Westbay Wells

Date: _____ Page 1 of 3

Technical Area: _____ Sample Identification: _____

Site Work Plan: _____ Well Number: _____

Zone Number: _____ Depth: _____

Field Team Member Signature: _____
(Print name and title, then sign.)

WATER SAMPLED:

Sample Type: _____

Zone Number: _____

Depth: _____

Sampling Period: Start _____ Complete _____

SAMPLING INFORMATION

Filter Size: _____

Thermometer ID: _____

EC Meter ID: _____

pH Meter ID: _____

Alkalinity Kit ID: _____

Turbidity Kit ID: _____

Preservation Methods and Comments: _____

PARAMETER MEASUREMENTS WHILE SAMPLING

Negative Log Base 10 of Hydrogen-Ion Activity (pH): _____ S.U.

Specific Conductance EC: _____ $\mu\text{S}/\text{cm}$

Temperature (Temp): _____ $^{\circ}\text{C}$

Dissolved Oxygen (DO): _____ mg/L

Turbidity (Turb): _____ NTU

Alkalinity (Alk): _____ mg/L, CaCO_3

Pressure: _____ (psi)

SAMPLE TYPES

D – Duplicate
F – Field
K – Known

T – Trip
R – Replicate
A – Acid Blank

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Attachment D: Water Quality Sampling Record for Westbay Wells (cont'd)

Date: _____

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Technical Area: _____ Well Number: _____

CALIBRATION INFORMATION

Date/Time of EC Calibration: _____

Standard Solution: _____ μ S/cm, Instrument Reading _____ Lot No. _____ Exp. Date: _____

Standard Solution: _____ μ S/cm, Instrument Reading _____ Lot No. _____ Exp. Date: _____

Date/Time of pH Calibration: _____

Standard Solution _____ pH, Instrument Reading _____ pH solution Lot No. _____ Date: _____

Standard Solution _____ pH, Instrument Reading _____ pH solution Lot No. _____ Date: _____

Slope _____

Date/Time of Turbidity Calibration: _____

Date/Time of Dissolved Oxygen Meter Calibration: _____

SHIPPING INFORMATION

Lab(s) Shipped To: _____

Date(s) Shipped: _____

Method of Shipment: _____

Comments: _____

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Date: _____ Page 3 of 3

Technical Area: _____ Well Number: _____

Zone Number: _____

Depth: _____

Signature: _____

(Print name and title, then sign.)

[illegible]

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Attachment E: Instructions for Completing Water Quality Sampling Record for Westbay Wells

Use an indelible dark-ink pen. Make an entry in each blank. For entry blanks for which no data are obtained (except in Comments section), enter "UNK" for unknown, "N/A" for not applicable or "ND" for not done, as appropriate. To change an entry, draw a single line through it, add the correct information above it and date, initializing the change. For all forms, complete the following information:

Header Information:

1. Date—The date the zone was sampled.
2. Technical Area (TA)—Two-digit number which indicates the TA in which the activity is being performed.
3. Monitoring Well Identification—Alphanumeric designation indicating the specific monitoring well location.
4. Sample Identification—Follow SOP-01.04, Sample Control and Field Documentation for sample identification.
5. Site Work Plan—Title of plan.
6. Field Team Member Identification—Print your name and position title, then sign.

Groundwater Sampled:

1. Indicate the well number, zone, and depth of zone of the well being sampled.
2. Sample Types—One-character codes that distinguish the type of sample collected. This classification permits the analysis of data for specific groups of samples. The codes are identified at the top of the form's first page.
3. Sample Period—The starting and ending times of sample collection, in military time format.

Sampling Information:

1. Filter size—Size of filter used.
2. Thermometer ID—The identification of the thermometer used.
3. Conductivity Meter ID—The control number or serial number and manufacturer of the meter used to measure the specific conductance of samples or calibration solutions.
4. pH Meter ID—The control number or serial number and manufacturer of the meter used to measure the pH of the samples.
5. Oxidation-Reduction Potential (ORP) Meter ID---The control number and manufacturer of the meter used to measure the P of the samples or calibration solutions.
6. Alkalinity Kit ID—Identification and model or serial number of the alkalinity kit used.
7. Turbidity Meter ID— The control number or serial number and manufacturer of the meter used to measure the turbidity of samples or calibration solutions.
8. Preservation Methods and Comments—Include preservation method, acidified or non-acidified, type of acid (if acid was used to preserve water sample), and any additional information regarding preservation.

Parameter Measurements (Recorded at the time of sample collection.):

1. Negative Log Base 10 of Hydrogen-Ion Activity—The pH value in standard units (S.U.).
2. Oxidation-reduction potential in \pm milli Volts (mV).
3. Specific Conductance (EC)—The specific conductance of the water sample in micro-seimen per centimeter ($\mu\text{S}/\text{cm}$).
4. Temperature—The temperature of the water sample in degrees Celsius ($^{\circ}\text{C}$).
5. Dissolved Oxygen—The dissolved oxygen content of the water sample in milligrams per liter (mg/L).
6. Turbidity—The turbidity of the water sample in nephelometric turbidity units (NTU).
7. Pressure—The pressure of the zone in pressure per square inch (psi).

Calibration Information:

1. Date/Time of EC Calibration—Date and time that the specific conductivity meter was last calibrated.
2. Standard Solution EC Readings—Record the standard specific conductance of the solution(s) used and the reading(s) when the probe was immersed. Include lot number(s) and expiration date(s) of the standard solution(s).
3. Date/Time of pH Calibration—Date and time that the pH meter was last calibrated.
4. Standard Solution pH Readings—Record the standard pH values of the two solutions used and the readings when the probe was immersed. Include lot numbers and expiration dates of the standard solutions. Also, if the meter indicates a slope after the calibrations record the number. Record the readings of pH solutions used in the calibration after each period of use (daily) to check for drift.
5. Date/Time of ORP operational check. Date and time the P probe and meter were last checked. Record the P value (+ mV) after probe is immersed in appropriate solution to check for operation of probe and meter. Include lot numbers and expiration dates of the standard solutions.
6. Date/Time of Turbidity Calibration—Date and time that the turbidity meter was last calibrated.
7. Date/Time of Dissolved Oxygen Calibration—Date and time that the D.O. meter was last calibrated.

Shipping Information:

1. Include the shipping date, method, and the laboratory where the samples were sent.
2. Comments—This is a space for additional information about any entry on the form.

Parameter Measurements:

1. Negative Log Base 10 of Hydrogen-Ion Activity—The pH units of the sample.
2. Specific Conductance—The specific conductance of the water in micro Seimens per centimeter ($\mu\text{S}/\text{cm}$).
3. Temperature—The temperature of the groundwater in degrees Celsius ($^{\circ}\text{C}$).
4. Dissolved Oxygen—The dissolved oxygen content of the water in milligrams per liter (mg/L).
5. Turbidity—The turbidity of the groundwater in nephelometric turbidity units (NTU).

6. Pressure—The pressure of the zone in pounds per square inch (psi).
7. Alkalinity—The alkalinity of groundwater in mg/L, CaCO₃.
8. ORP—Write the oxygen reduction potential of the sample (performed only when ordered by the site geochemist) under comments.

Comments: Note any other pertinent information.

Operations Manuals

MOSDAX Handheld Controller – Model 2525

Non-Vented Sample Bottle – Model 2420

MOSDAX Sample Probe – Model 2532